Space Weather Forecast

Issued on Tuesday 7 January 2025 at 01:29 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further Moderate flares likely. Slight chance G1 Minor geomagnetic storm conditions 07 Jan.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate with three Moderate-class flares observed, all originating from an active region in the northeast of the visible disc.

There are currently ten sunspot regions on the visible disc. Despite the number of spots on the Earth facing-disc, many are small and generally magnetically simple, with most showing little signs of significant growth or some slight decay in the last 24 hours. A complex spot in the northeast is the largest and most complex spot and has been responsible for the bulk of recent activity, with three strong class flares now recorded since appearing on the solar disc. A region in the southwest, though currently magnetically simple, saw two Common-class flares, one at 04/1444 UTC and another at 04/1827 UTC that generated significant coronal mass ejections (CMEs) on 04 Jan but has since remained relatively stable and soon to rotate of the western limb. It is likely both of these CMEs will pass ahead of Earths orbit, however there is a slight chance that the latter CME may deliver a glancing blow late on Day 1 (06 Jan) or early on Day 2 (07 Jan).

No Earth-directed CMEs were observed in available coronagraph imagery.

Solar Wind / Geomagnetic Activity: The solar wind environment was enhanced due to the ongoing, but slowly declining connection to the fast wind of a large coronal hole in the northwest disc. Solar wind speeds were Elevated to Strong, broadly declining from around 550km/s to 500km/s during the period, but with a peak of 616km/s at 06/1532 UTC. The Interplanetary Magnetic Field (IMF) was weak throughout, meanwhile the important north-south component, Bz, varied weakly between positive (northward) and negative (southward) directions.

Geomagnetic activity was Quiet to Active (Kp2-4).

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10MeV) at GOES-18 was below the S1/Minor Storm threshold, but slightly above normal background levels (on a declining trend).

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

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Four-Day Space Weather Forecast Summary

Solar Activity: Moderate to High, with further Moderate flares likely and a slight chance of further isolated strong flares, mainly from the moderately complex sunspot region in the northeast.

Solar Wind / Geomagnetic Activity: There is a slight chance of a glancing blow from a Coronal Mass Ejection (CME) early on Day 1 (07 Jan), but it is more likely that the CME will pass ahead of Earth's orbit. Similarly, a CME that left the Sun on 03 Jan is also expected to miss Earth. Further analysis is required for a potential CME that occurred on 06 Jan, with updates to be provided in subsequent bulletins.

Earth's connection to a solar fast wind associated with a large coronal hole is forecast to wane over the next few days. Elevated solar winds are expected to decline to Slightly Elevated levels on Day 1 (07 Jan), perhaps returning to background levels by Day 2 (08 Jan). The next fast wind enhancement is likely on Day 4 (10 Jan), but forecast to be weaker with speeds probably peaking at Slightly Elevated levels.

Geomagnetic activity is expected to be Quiet to Active on Days 1 and 4 (07 and 10 Jan) and Quiet to Unsettled on Days 2 and 3 (08 and 09 Jan). There is a slight chance of peak G1/Minor Storm conditions on Day 1 (07 Jan) should any CME influence occur.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is below the S1/Minor Storm threshold, but slightly above normal background levels (on a declining trend). There is a slight chance of exceeding the S1/Minor Storm threshold during the period.

Geomagnetic Storms

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	**G1 to G2**	No	10	1	1	5
Strong	**G3**	No	1	1	1	1
Severe	**G4**	No	1	1	1	1
Extreme	**G5**	No	1	1	1	1

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Radio Blackouts - X-Ray Flares

X-Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 (M Class)	Yes	70	70	70	70
Very Active	R3-R5 (X Class)	No	10	10	10	10

Solar Radiation Storms (High Energy Protons)

Radiation Storms	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	20	20	20	20
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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